Central Coast Juvenile Herring Survey, August 2010

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ABSTRACT

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In 2010, a Central Coast juvenile herring survey was conducted from August 8-20. Sixty-four sets were made at 13 locations within Statistical Management Areas 6, 7, 8 and 9. The study area extended from Meyers Passage in the north to Rivers Inlet in the south. The survey serves to address information gaps on the distribution, abundance, size and feeding habits of juvenile herring in these nearshore, northern waters.

Nineteen species of fish were identified in all purse seine catches with Pacific herring (*Clupea pallasi*) being the most frequently encountered species. A total of 5810 herring were measured resulting in a length frequency distribution that was distinctly bimodal representing age-0+ and age-1+ fish. Age-0+, age-1+, and age-2+ or older herring occurred in 87.50%, 60.94%, and 12.50% of the sets, respectively. Two oblique plankton tows were performed at each of the 13 locations resulting in a total of 26 tows during the survey. *Acartia longimeres* occurred in all samples and *Acartia longimeres, Pseudocalanus sp.* and larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) showed up in the largest biomass.

RÉSUMÉ

Thompson, M., Fort, C., and Therriault, T.W. 2011. Central Coast juvenile herring survey, August 2010. Can. Manuscr. Rep. Fish. Aquat. Sci. 2952: vi + 39 p.

En 2010, une campagne de recensement portant sur les stocks de harengs juvéniles de la partie centrale de la côte a été effectuée entre le 8 et le 20 août. Au total, 64 traits de senne ont été réalisés à 13 endroits différents des zones de gestion statistiques 6, 7, 8 et 9. Le secteur couvert s'étendait du passage Meyers, au nord, à l'inlet Rivers, au sud. Le relevé vise à combler les lacunes dans les données sur la répartition, l'abondance, la taille et les habitudes alimentaires des harengs juvéniles dans ces eaux littorales du nord.

En tout, 19 espèces de poissons ont été dénombrées dans les ponctions effectuées, le hareng du Pacifique (*Clupea pallasi*) étant l'espèce la plus souvent représentée, et 5810 harengs ont été mesurés. Les résultats indiquent une distribution nettement bimodale e la fréquence des longueurs, représentant la prédominance des individus d'âge 0+ et d'âge 1+. Les harengs des classes d'âge 0+, 1+ et 2+ correspondaient respectivement à 87,50 %, 60,94% et 12,50 % des poissons récoltés dans les traits. Deux traits obliques de filets à plancton ont été effectués à chacun des 13 endroits, pour un total de 26 traits. *Acartia longimeres* présents dans tous les échantillons, alors que *Acartia longimeres, Pseudocalanus* sp. et des larvaces (*Oikopleura* sp. et *Fritillaria* sp.) constituaient la biomasse la plus élevée.

INTRODUCTION

Pacific herring (*Clupea pallasi*) are an important commercial species and a vital forage fish for many marine mammals, birds and other fish in British Columbia's coastal waters. Herring spawn principally on marine vegetation in the subtidal and upper intertidal zone between February and June, with peak spawning between March and April (Humphreys and Hourston 1978). Larvae hatch in two to three weeks, and disperse with surface currents, metamorphosing into juvenile herring at a length of ~25mm (Hourston and Haegele 1980). Juvenile herring consist of two distinct age classes, age-0+ and age-1+, with recruitment for this species occurring at age 3 when they join the sexually mature spawning population (Hay and McCarter 1999). During daylight hours, juvenile herring congregate in schools, occasionally forming mixed aggregates with other pelagic species, close to shore near the bottom (Haegele 1997). At dusk, these fish migrate into surface waters to feed on plankton. During this time they are vulnerable to purse seine gear.

Relatively little is known about the distribution, abundance, size and feeding habits of juvenile herring in the Central Coast of British Columbia (Figure 1). In 2002-2004, and 2007-2010 juvenile herring surveys were designed to address information gaps and learn about the general biology of herring in this northern geographical area. The survey used an ecosystem based approach to biological sampling. Therefore, in addition to juvenile herring, all other fish species were retained for analyses. Also, plankton samples and oceanographic data samples were collected. This approach will potentially provide a better understanding of the role and relationships juvenile herring have in Central Coast waters, and may provide an empirical forecast of recruitment to the herring roe fishery based on relative juvenile abundance (Schweigert et. al. 2009).

METHODS

In 2010, the Central Coast juvenile herring survey was conducted from August 8-20. Sixty-four sets were made at 13 locations within Statistical Management Areas 6, 7, 8, and 9 (Table 1). The study area extended from Meyers Passage in the north to Rivers Inlet in the south (Figures 2 and 3). The 2010 set locations followed the 2007 survey (Thompson and Therriault 2009). The sampling sites originally were chosen based on known historical herring spawning sites, and represent both nearshore and open water habitats (Haegele and Armstrong 2003).

Fish Sampling

The 12 m, aluminum-hulled Fisheries Research Vessel *Walker Rock* was used for all fishing events. A 183 m long and 27 m deep purse seine net of knotless web, resulting in an area fished of ~2665 m^2, was used for all fishing events. The body of the net had 46 m of 22.2 mm mesh at the tow end followed by 91 m of 19.0 mm mesh, and the bunt end was 46 m of 9.5 mm mesh. The net fished to a depth of 10 m, and was able to retain fish greater than 20 mm in length. All sets were made after dusk when herring are feeding

near the surface. All sets were made "blind" at predetermined set locations. Five sets were completed per night for all locations. One set was cancelled in Burke Channel (set code 12) due to a large surface tide. For most sets, it was possible to land the entire catch for biological sampling. On occasion, it was not practical to land a large set in its entirety, so sub-sampling was necessary. When sub-sampling was required, a herring bucket was filled with randomly selected fish and retained for biological sampling. Several dipnet samples from various parts of the net (catch) would be used to make up the random sub-sample. The remainder of the set was released over the corkline, its size estimated as the number of buckets released. The number of herring caught in each set was determined by multiplying the sub-sample herring weight and number by the number of estimated buckets released (total catch). The number of other species caught in the sub-sample was determined in the same manner (Table 2). All fish retained for sampling were weighed, bagged and preserved in a 3.7 % seawater formalin solution, with the exception of large predator species (e.g., adult salmon, dogfish and flatfish). These fish were individually weighed and measured in the field. Retained samples were taken back to the Pacific Biological Station for laboratory analysis.

From each set, 100 or more herring from each represented age-class and all other fish species caught were identified, weighed and measured. If the set contained less than 200 herring, then all herring were weighed and measured. Consistent with standard practices, herring were measured to standard length; salmon and sardine to fork length; dogfish, hake and pollock to total length. All other fish species were measured to standard length.

Plankton Sampling

Twenty-six stepped oblique plankton tows were performed during the survey (Figures 4 and 5). Two plankton samples were taken from each location, one sample "nearshore" and the other "offshore or channel". The tows were completed after dusk and immediately before fishing events. Dual 19 cm diameter bongo nets with 350 μm mesh were used for sampling, resulting in 'left' and 'right' bongo plankton samples (only left samples were processed). The bongos were lowered to 20m and raised by an electric winch at a rate of 1m every 15 seconds. A General Oceanics® 2030R model flowmeter was attached to the left bongo to determine the volume of seawater filtered. Volume filtered was calculated using the following equation (McCarter and Hay 2002):

$$\mathbf{V = (A \cdot F \cdot K) / 999{,}999}$$

Where:

V = volume of water filtered through the plankton net (m^3)
A = area of net opening (0.02835 m^2)
F = number of revolutions recorded by the flow meter (m)
K = standard speed rotor constant for 7cm rotor (26,873)

Upon retrieval, the bongo nets were washed with a high pressure deck hose, and the samples preserved in 3.7 % seawater formalin.

In the laboratory, a volumetric splitter was used to reduce the sample size to a point where organisms could be conveniently counted and identified in a counting tray using a stereo microscope under 30X magnification. Sample splitting continued until a target size of roughly 300 organisms was reached (Thompson et al. 2003).

When possible, plankters were identified to the lowest taxonomic level. Copepods were identified to species. Densities for all plankters were determined and expressed as plankters $\cdot$ m^{-3}.

RESULTS

Sixty-four sets were made during the 2010 survey; five in section 101 (Rivers Inlet), five in section 091 (Fish Egg Inlet), five in section 085 (Kwakshua Channel), five in section 076 (Kildidt Sound), ten in section 067 (Kitasu Bay and Meyers Passage), five in section 077 (East Higgins Pass), ten in section 072 (Powell Anchorage and Spiller Channel), five in section 073 (Hunter Channel), four in section 084 (Burke Channel), and five in section 081 (Dean Channel). All set locations correspond to set locations used in the 2007 Central Coast survey (Figures 2 and 3, Table 1). One set was cancelled in Burke Channel (set code 12) due to a large surface tide.

Nineteen species of fish and two invertebrate species were identified in the purse seine catches. The most frequently encountered species (>25% occurrence) included: Pacific herring and capelin (Tables 2 and 3).

Herring

A total of 5810 herring were measured resulting in a bimodal length-frequency distribution. Based on this length-frequency distribution (Figure 6), the length designations for the two juvenile herring age-classes are:

0+ = herring less than or equal to 92 mm standard length
1+ = herring between 93 mm and 142 mm standard length
2+ and older = herring greater than or equal to 143 mm standard length

Age-0+ herring occurred in 56 of the 64 sets (87.50 % occurrence; Table 3). Table 4 shows the average length and weight for age-0+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-0+ herring (n=4731) was 61 mm and 2.99 g respectively.

Age-1+ herring occurred in 39 of the 64 sets (60.94% occurrence; Table 3). Table 4 shows the average length and weight for age-1+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-1+ herring (n=1055) was 119 mm and 23.93 g respectively.

Age-2+ herring occurred in 8 of the 64 sets (12.5 % occurrence; Table 3). Table 4 shows the average length and weight for age-2+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-2+ herring (n=24) was 152 mm and 51.21 g respectively.

The relationship between length and weight for all sampled herring was determined by fitting a logistic function to the length-weight data (Figure 8). Burke Channel, Thompson Bay and Kitasu Bay sets resulted in the least amount of herring caught in relation to total catch. Kwakshua, Kildidt Sound and Spiller Channel sets resulted in the highest amount of herring caught (Table 2 and 4).

Plankton

There were 23 categories of organisms identified in 26 plankton samples (Tables 5 and 6). An average of 14.2158 m^3 of water was filtered per plankton tow. *Acartia longimeres* copepod occurred in all samples. *Acartia longimeres*, shrimp larvae, amphipods, larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) and *Pseudocalanus sp.* occurred in >90 % of samples (Table 7). *Acartia longimeres, Pseudocalanus sp.* and larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) made up ~50 % of all zooplankton biomass captured.

CONCLUSION

Sixty-four stations were sampled resulting in 19 different fish species being recorded from the purse seine sets. A total of 5810 herring were measured and weighed creating a distinct bimodal histogram representing two juvenile herring age groups. Twenty-six plankton tows were performed with all plankton samples being processed. This resulted in *Acartia longimeres* occurring in all samples and *Acartia longimeres, Pseudocalanus sp.* and larvaceans (*Oikopleura sp.* and *Fritillaria sp.*) showing up in the largest biomass.

ACKNOWLEDGMENTS

This study was funded by Fisheries and Oceans Canada (DFO) along with vessel support and laboratory facilities. The research vessel was skippered by Don Houston. Don provides many years of valuable experience as a herring fisherman and knowledge of the Central Coast. All plankton samples were processed by Carol Cooper of Zotec Services. Thanks to Kristen Daniel for producing location maps.

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Thompson, M., and Therriault, T.W. 2009. Central Coast juvenile herring survey, August 2007. Can. Manuscr. Rep. Fish. Aquat. Sci. 2867: vi + 53 p.

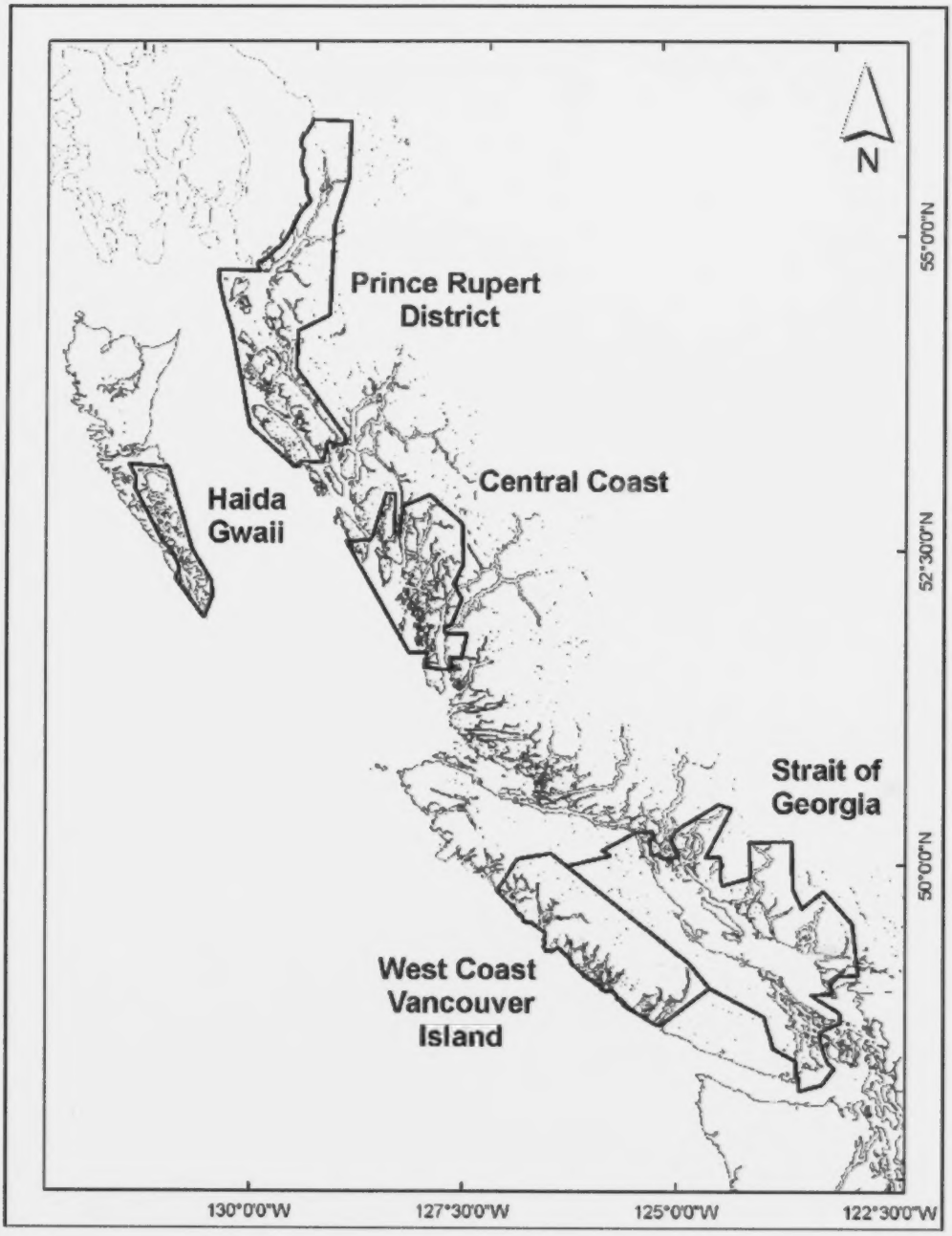


Figure 1. The five major British Columbia herring stock assessment areas.

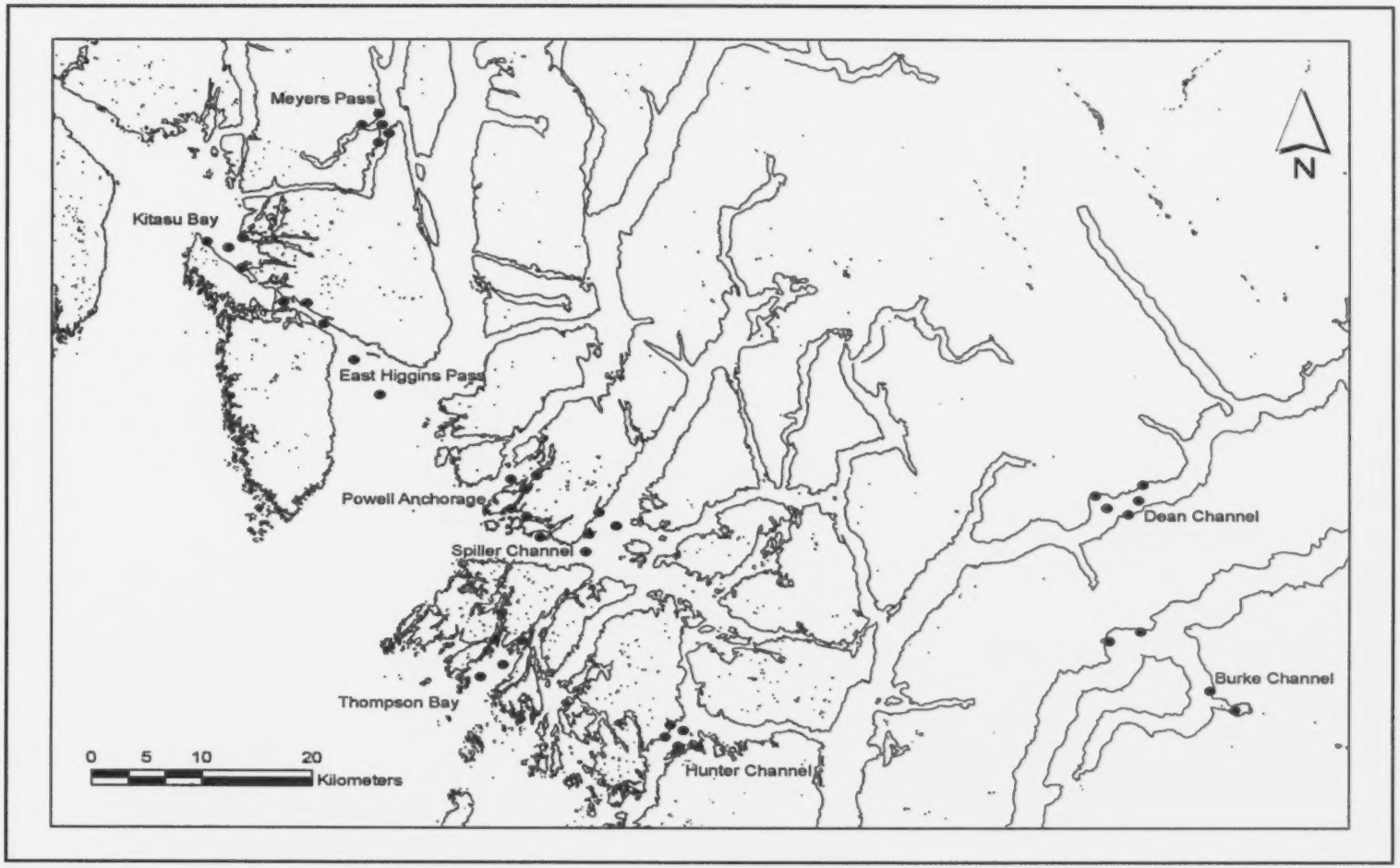


Figure 2. Upper Central Coast purse seine set locations for the 2010 juvenile herring survey.

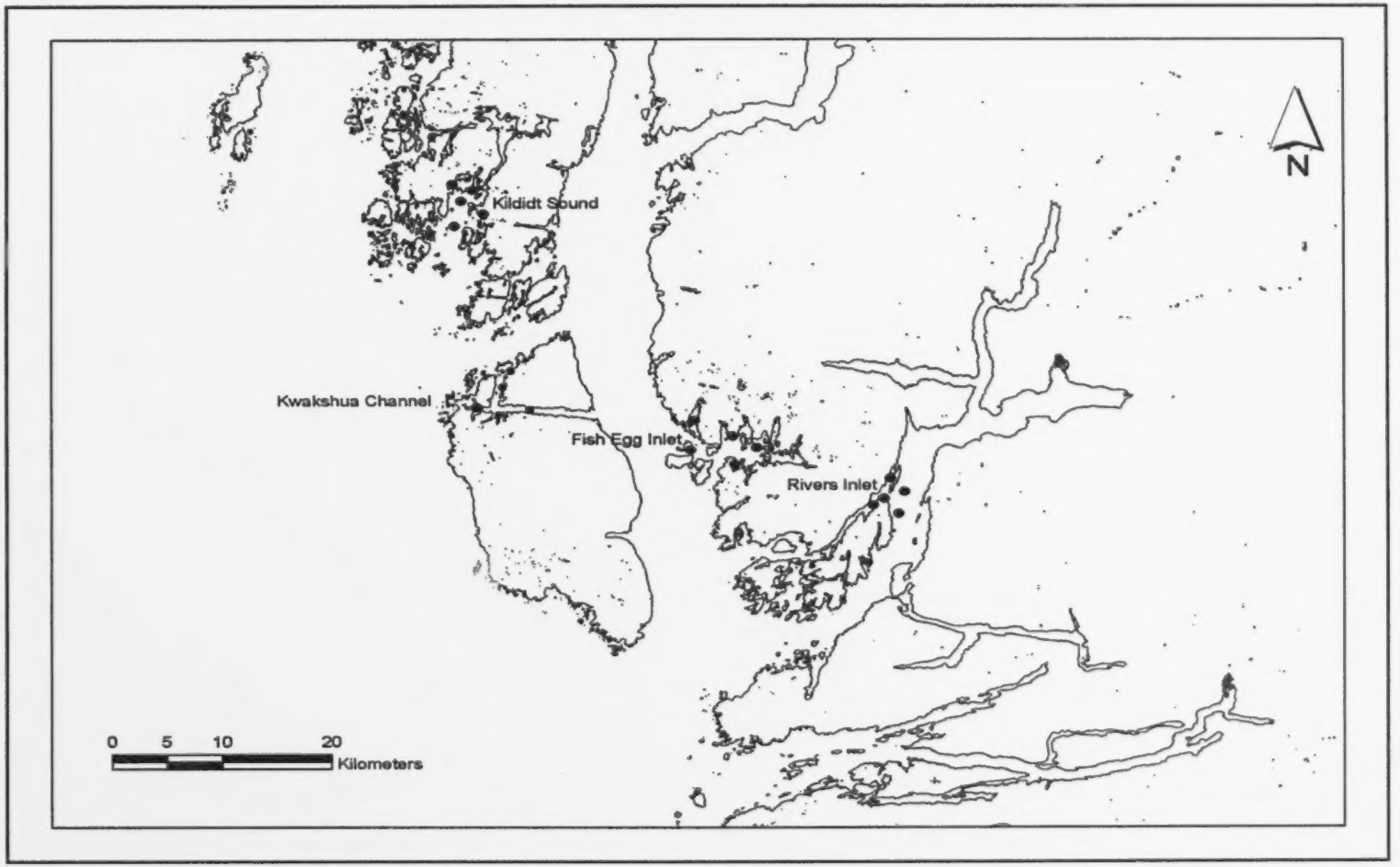


Figure 3. Lower Central Coast purse seine set locations for the 2010 juvenile herring survey.

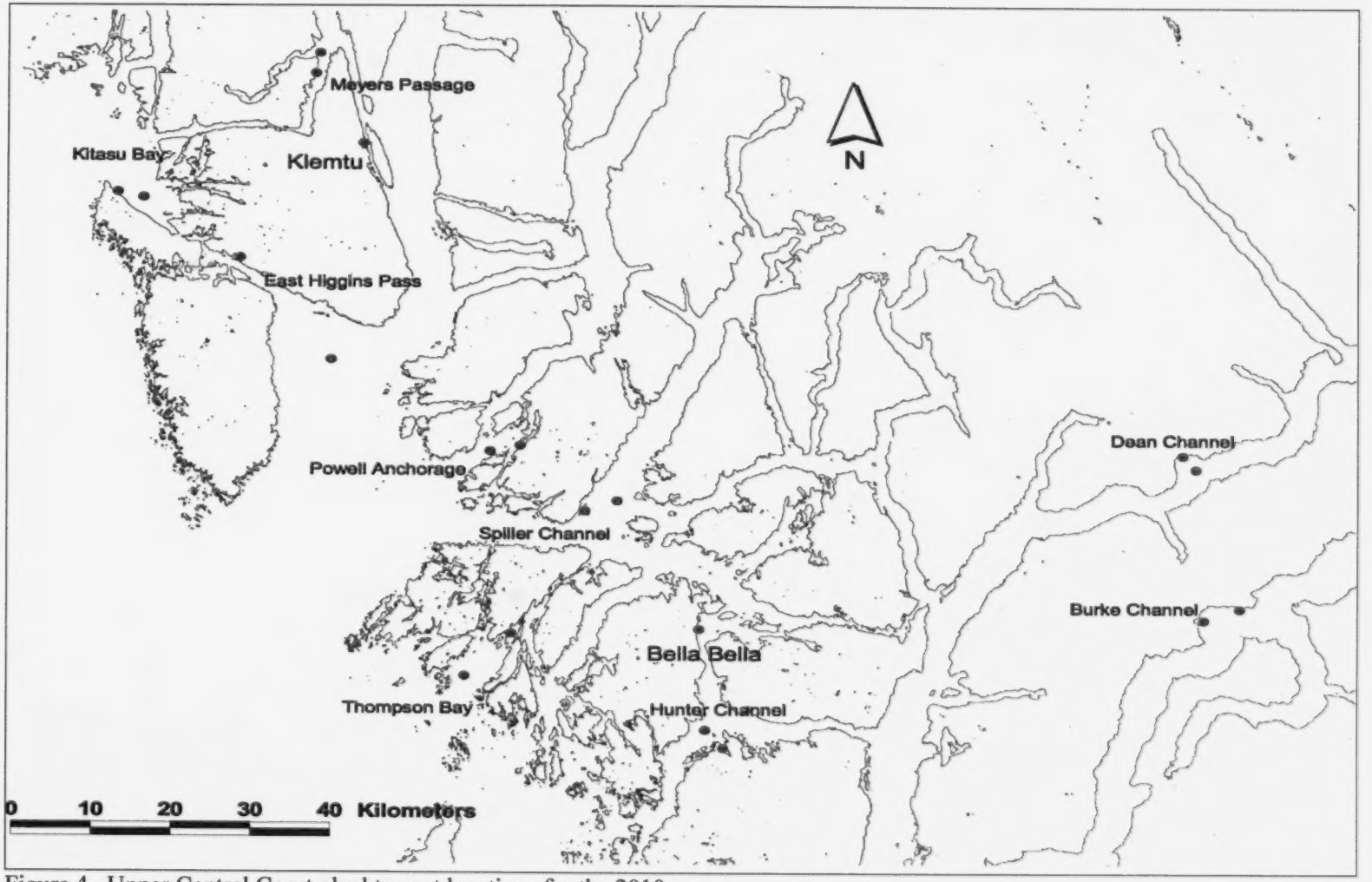


Figure 4. Upper Central Coast plankton set locations for the 2010 survey.

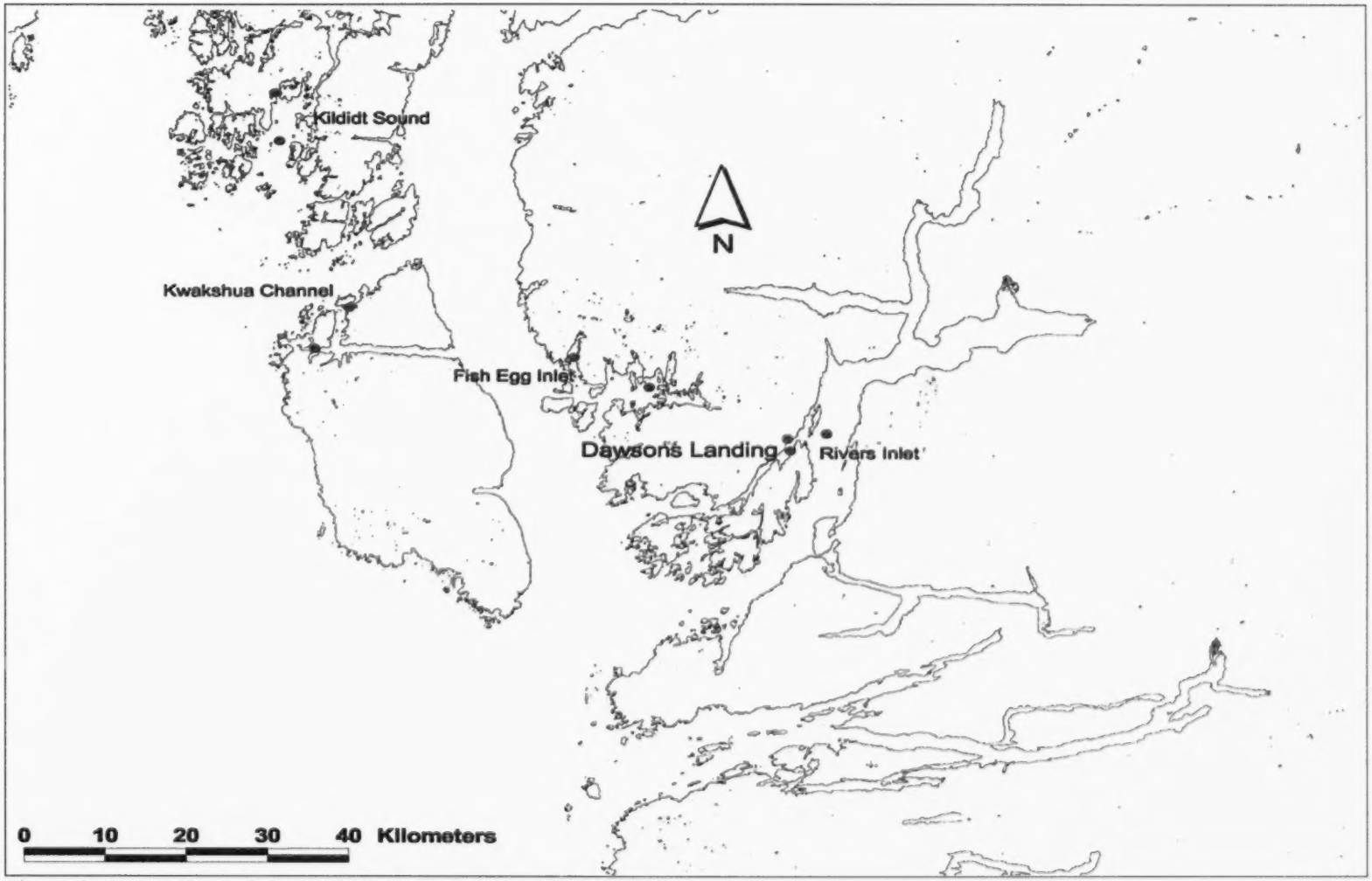


Figure 5. Lower Central Coast plankton set locations for the 2010 survey.

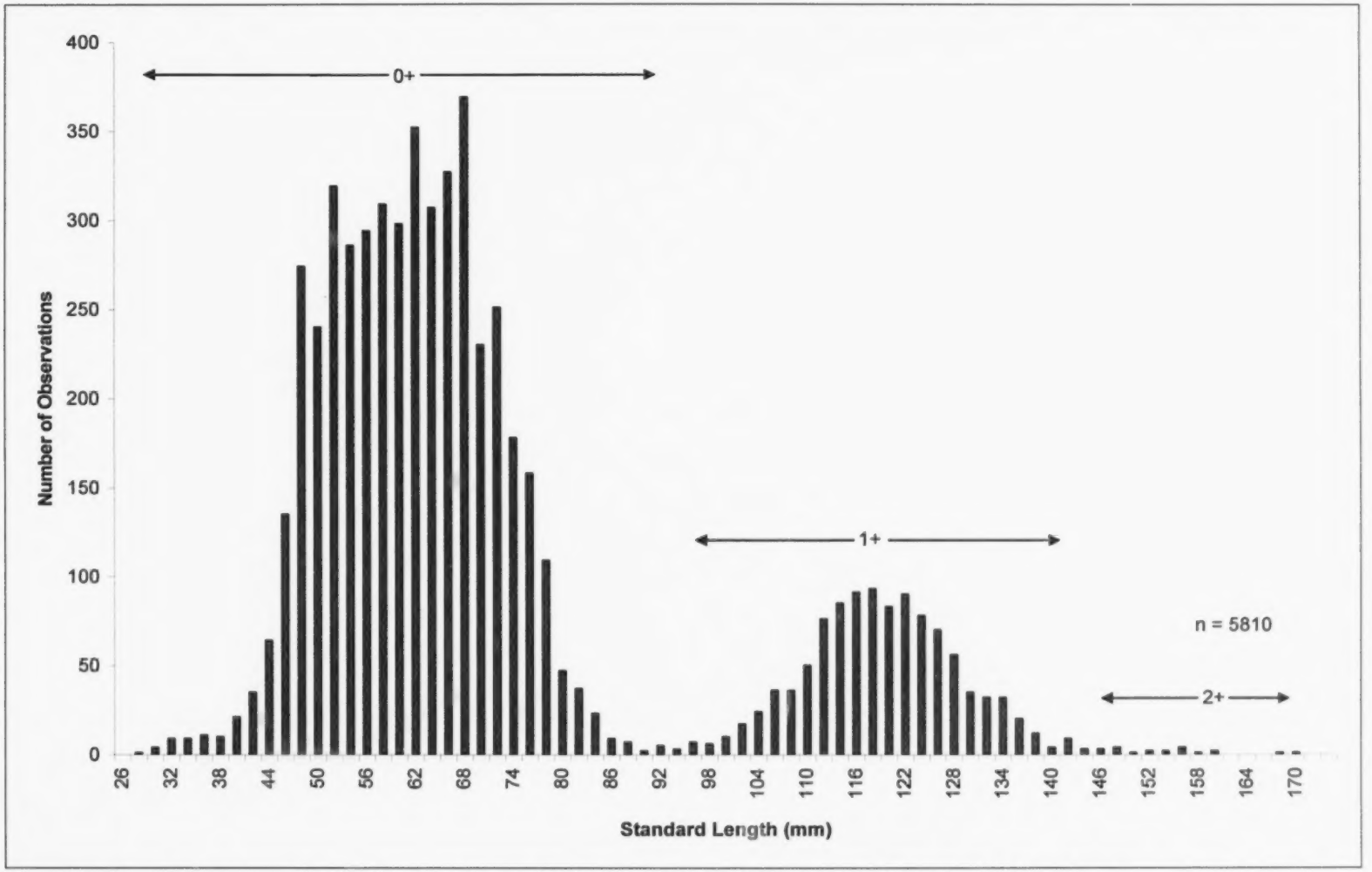


Figure 6. Length-frequency distribution for all sampled herring from the 2010 Central Coast juvenile herring survey.

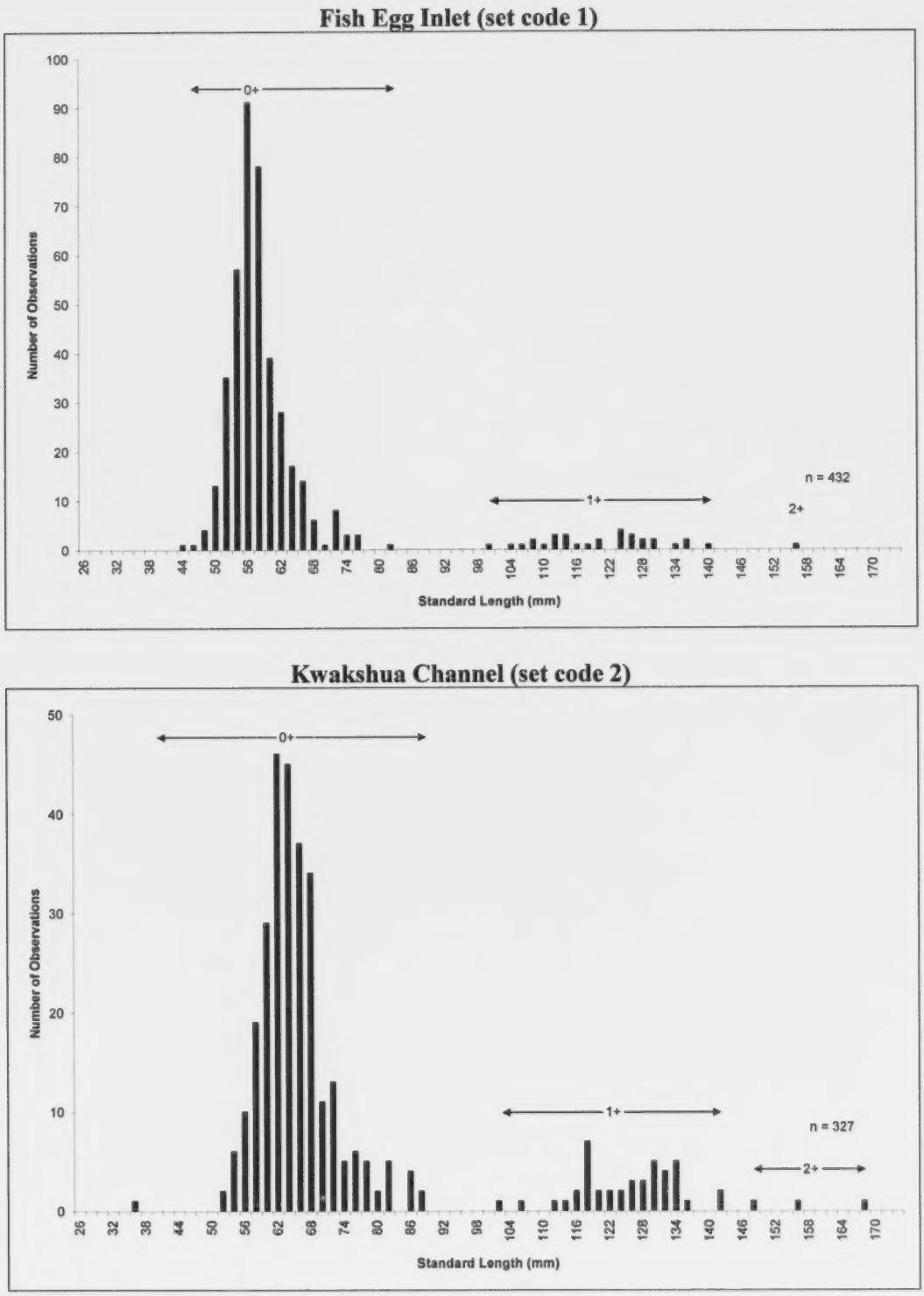
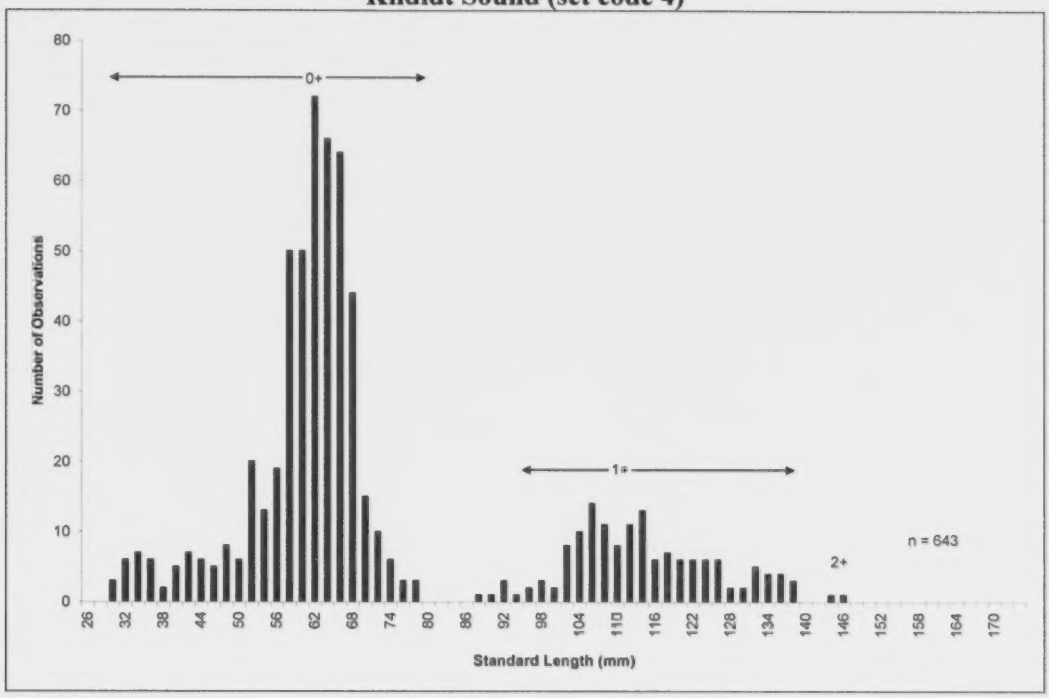


Figure 7. Length-frequency histograms by location (set code) for the 2010 Central Coast juvenile herring survey.

Kildidt Sound (set code 4)



Thompson Bay (set code 5)

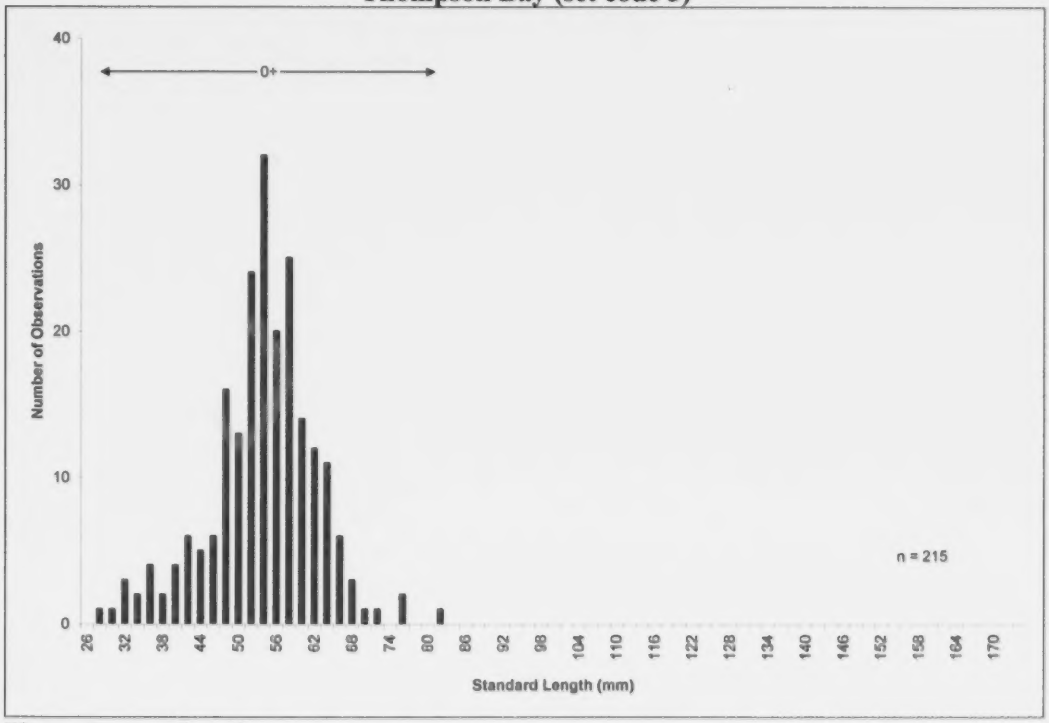
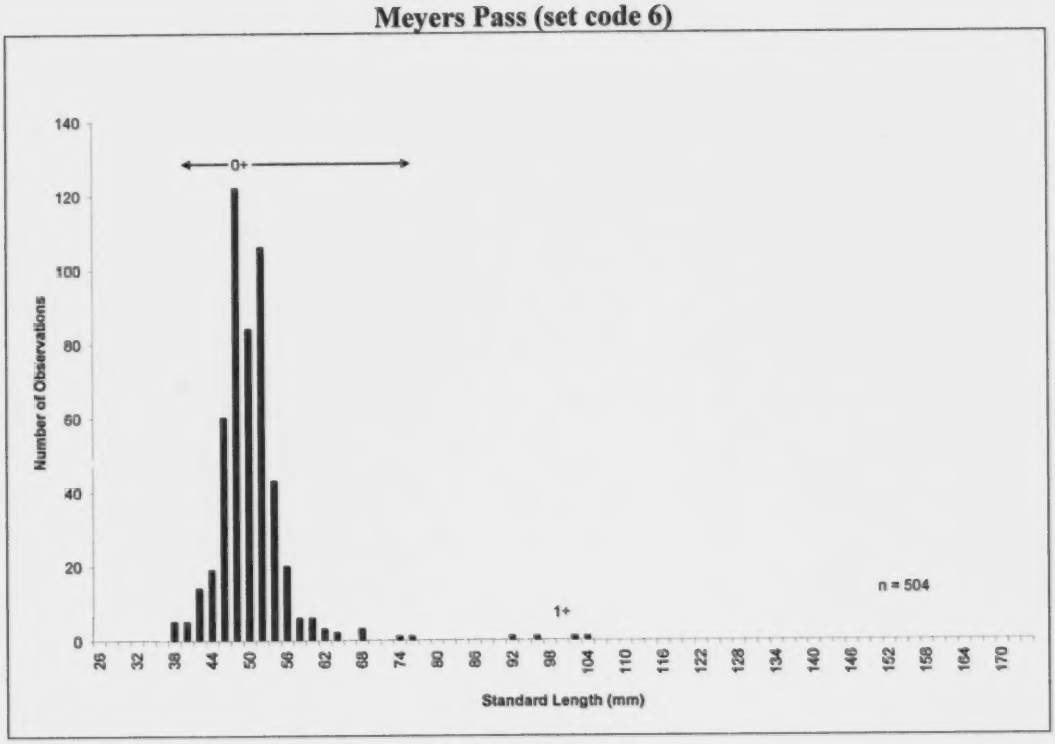


Figure 7…continued

Meyers Pass (set code 6)



Kitasu Bay (set code 7)

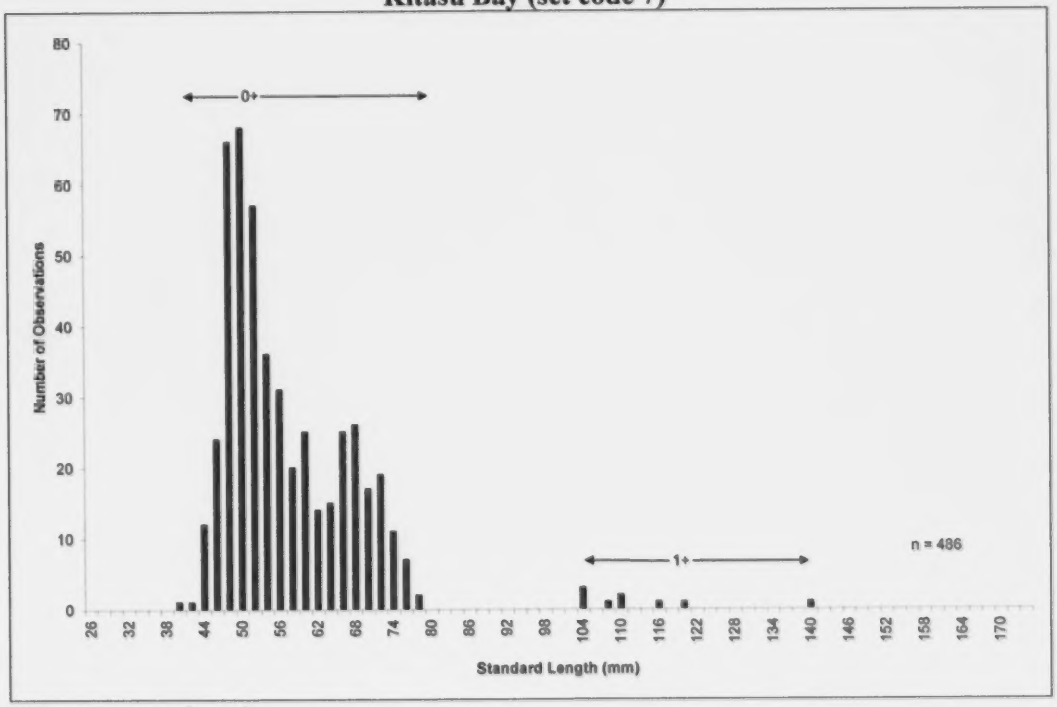
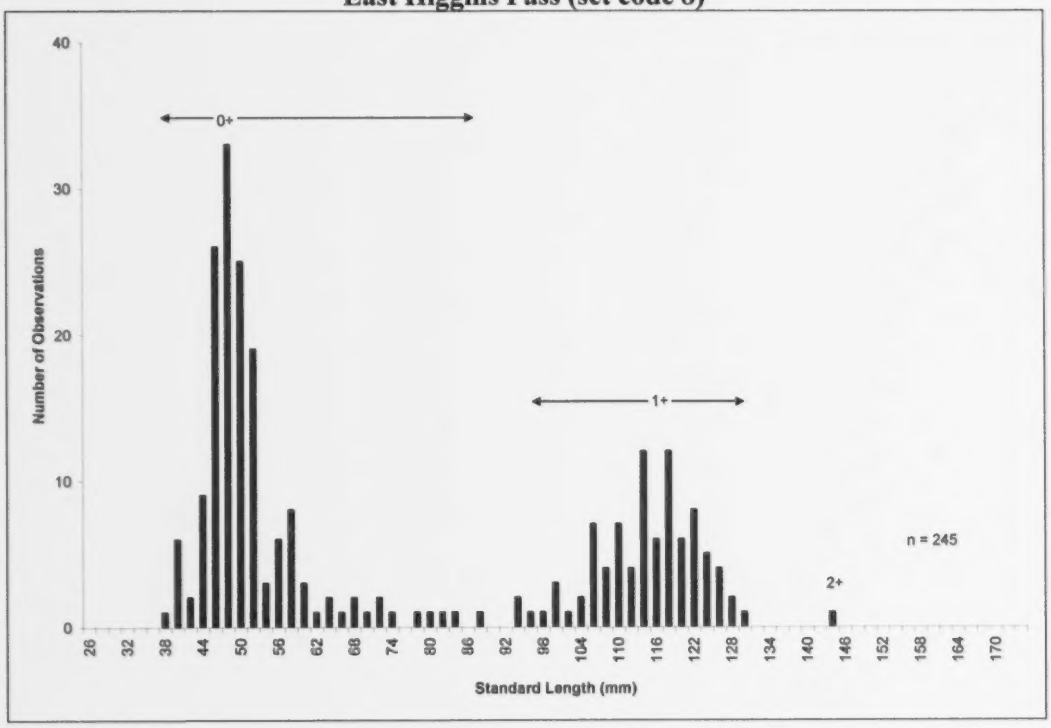


Figure 7…continued

East Higgins Pass (set code 8)



Powell Anchorage (set code 9)

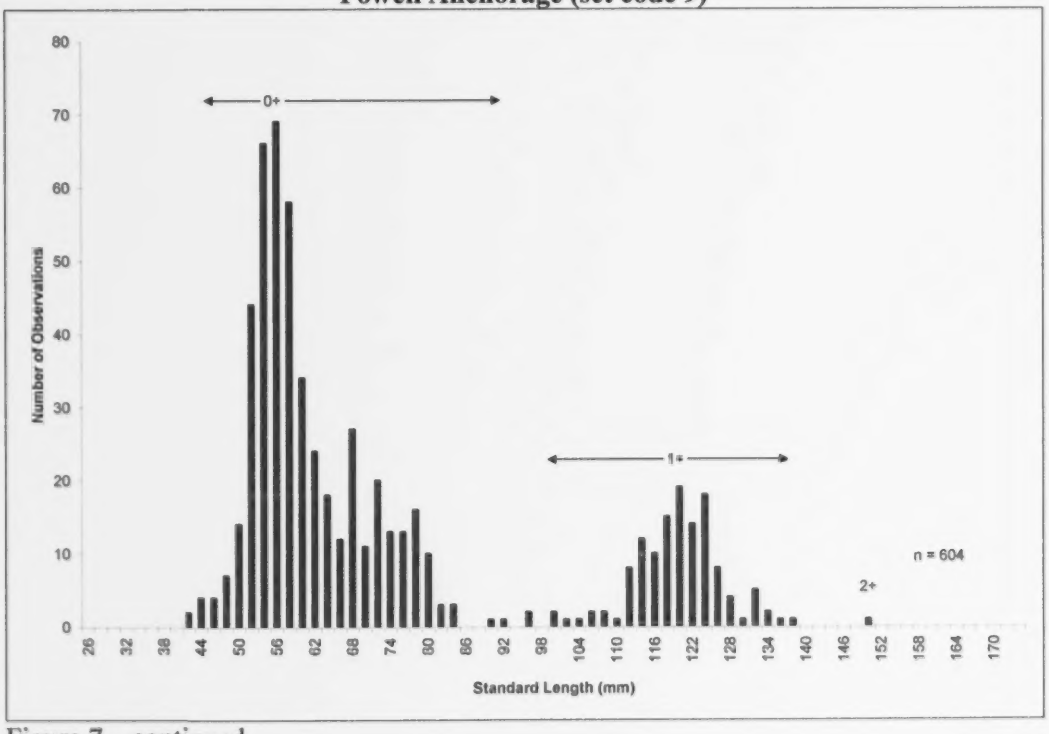
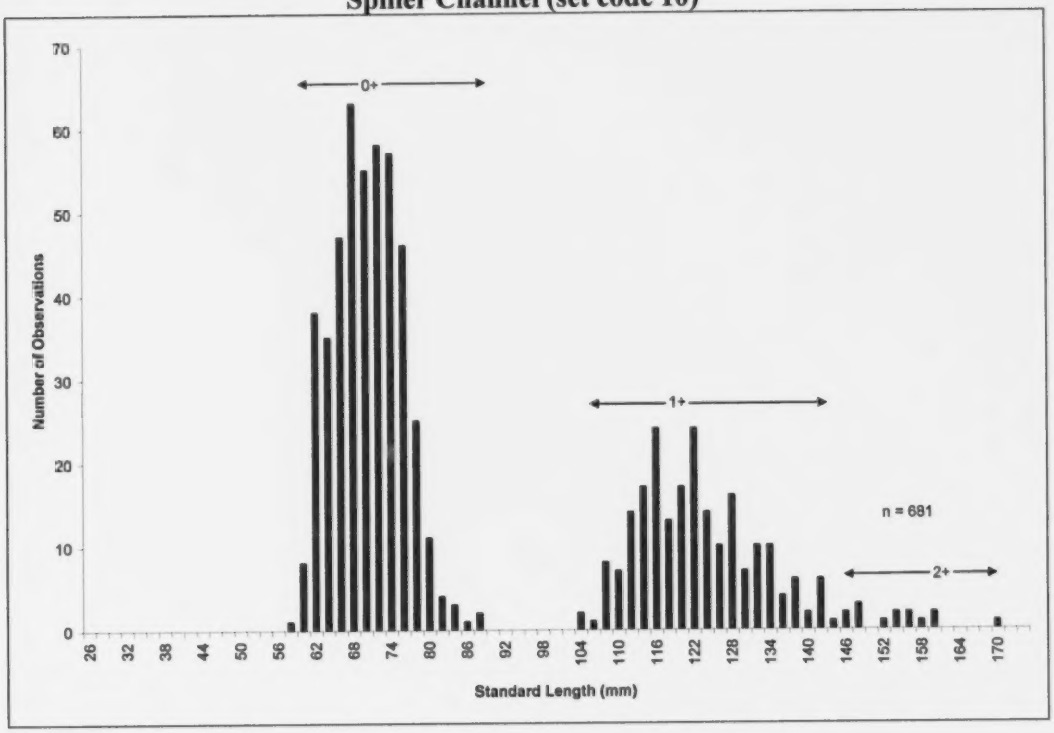


Figure 7...continued

Spiller Channel (set code 10)



Hunter Channel (set code 11)

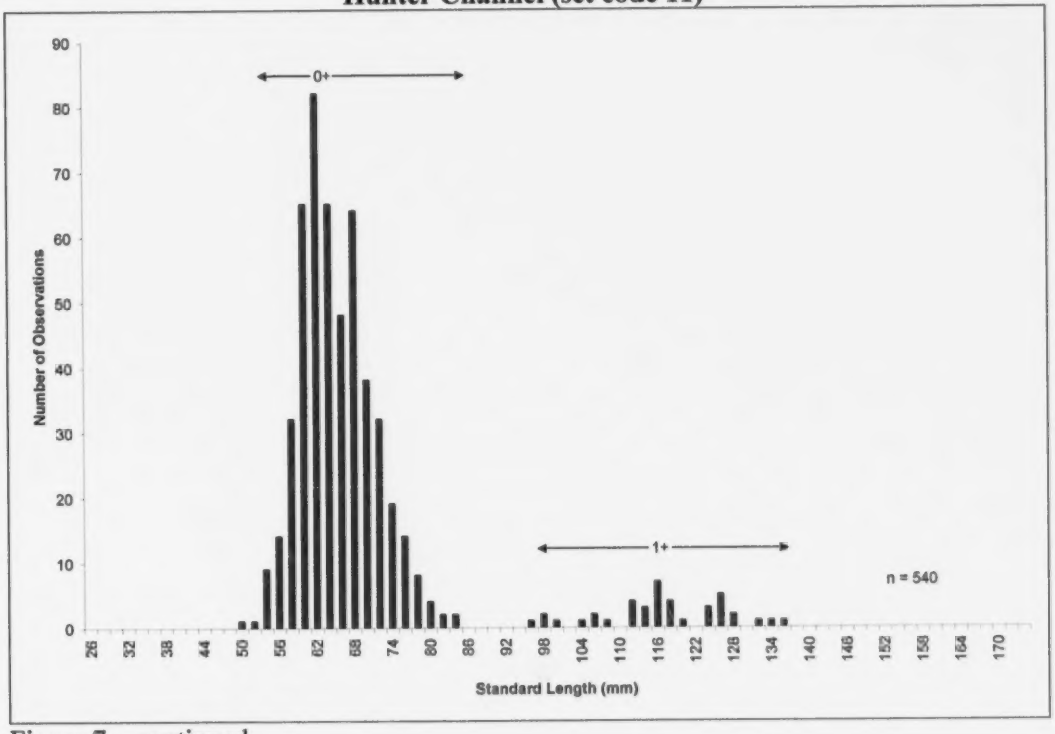
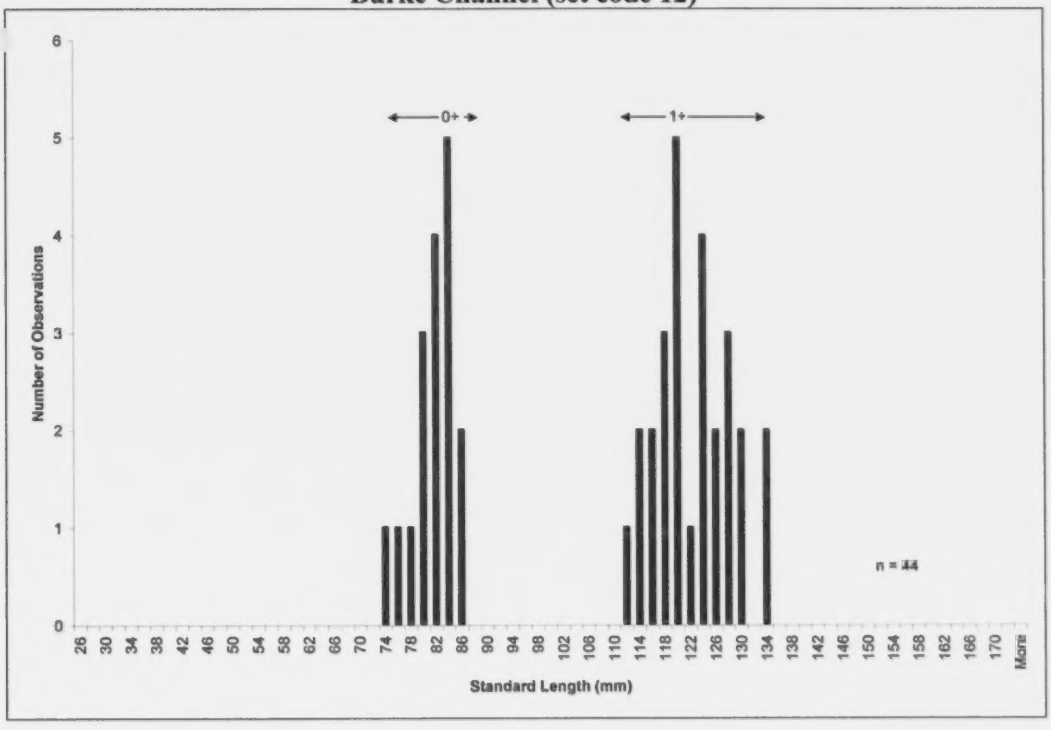
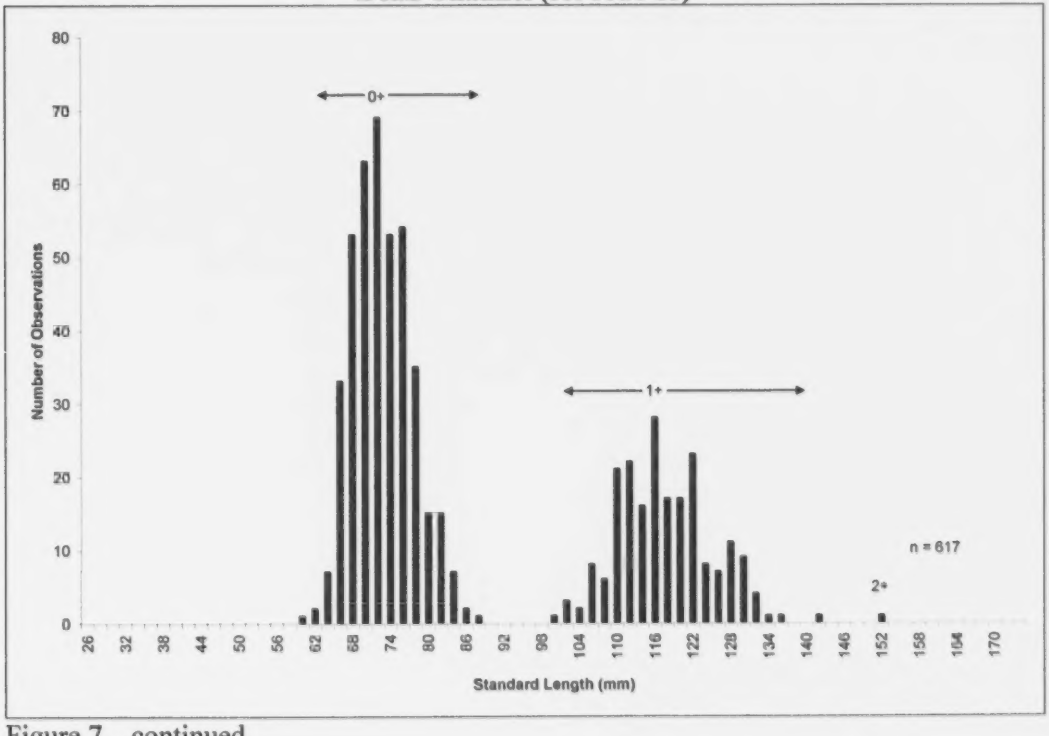


Figure 7…continued

Burke Channel (set code 12)



Dean Channel (set code 13)



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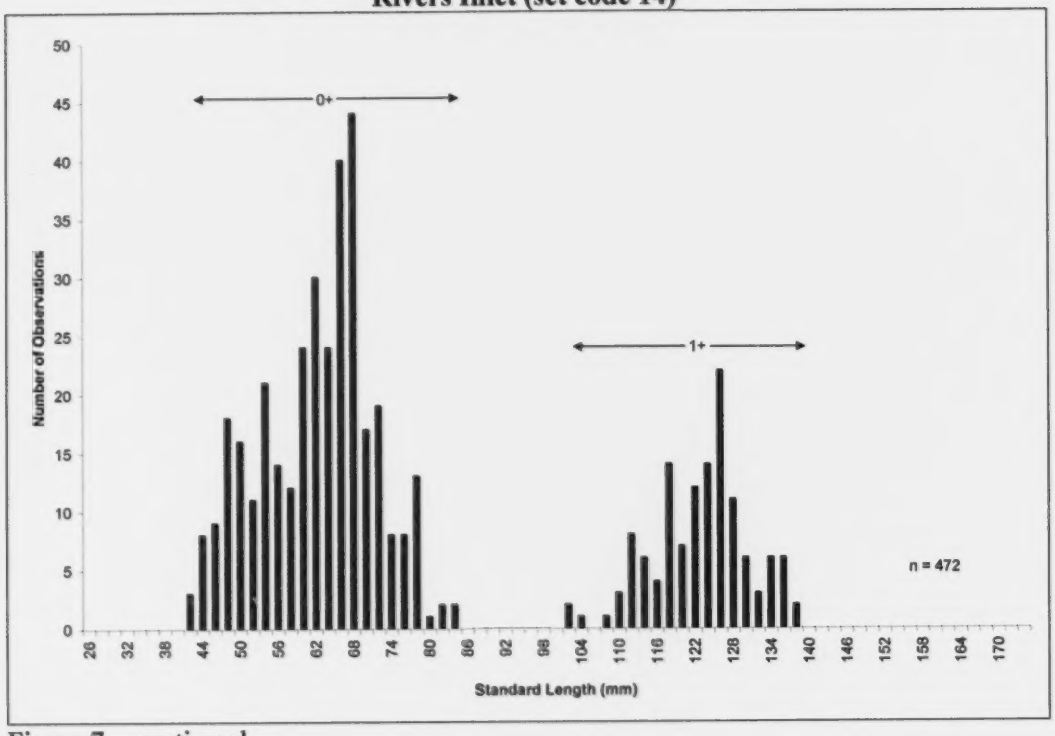

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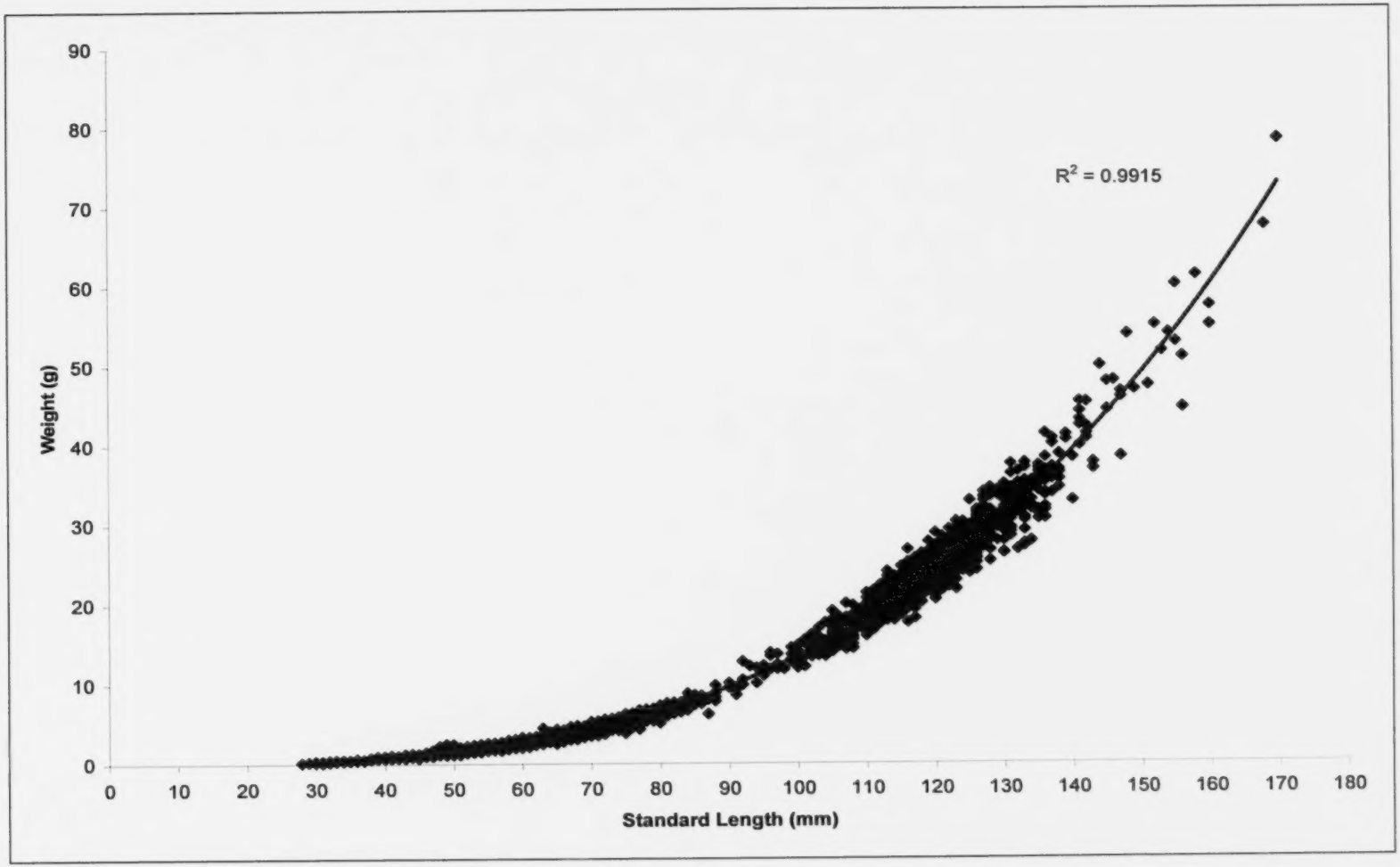

Figure 8. Length-weight relationship for all sampled herring from the 2010 Central Coast juvenile herring survey.

Table 1. Summary of the purse seine set locations from the 2010 Central Coast juvenile herring survey.

Set	Year	Month	Set Day	Set Location Name	Set Code	Station	Set Start Time	DD Lat (N)	DD Long (W)
1	2010	8	8	Kwakshua Channel	2	4	2205	51.6550	128.1150
2	2010	8	8	Kwakshua Channel	2	3	2235	51.6480	128.0910
3	2010	8	8	Kwakshua Channel	2	2	2305	51.6550	128.0530
4	2010	8	8	Kwakshua Channel	2	1	2340	51.6760	128.0880
5	2010	8	8	Kwakshua Channel	2	5	0005	51.6912	128.0768
6	2010	8	9	Dean Channel	13	1	2205	52.3181	127.5974
7	2010	8	9	Dean Channel	13	2	2230	52.3058	127.5816
8	2010	8	9	Dean Channel	13	3	2255	52.2997	127.5533
9	2010	8	9	Dean Channel	13	4	2320	52.3139	127.5398
10	2010	8	9	Dean Channel	13	5	2340	52.3297	127.5348
11	2010	8	10	Burke Channel	12	4	2210	52.1719	127.5732
12	2010	8	10	Burke Channel	12	6	2245	52.1820	127.5321
13	2010	8	10	Burke Channel	12	2	2345	52.1239	127.4380
14	2010	8	10	Burke Channel	12	5	0020	52.1051	127.4035
15	2010	8	11	Kildidt Sound	4	3	2215	51.8370	128.1540
16	2010	8	11	Kildidt Sound	4	4	2240	51.8500	128.1160
17	2010	8	11	Kildidt Sound	4	1	2305	51.8620	128.1460
18	2010	8	11	Kildidt Sound	4	5	2330	51.8734	128.1317
19	2010	8	11	Kildidt Sound	4	2	0000	51.8790	128.1590
20	2010	8	12	Thompson Bay	5	1	2215	52.1210	128.4070
21	2010	8	12	Thompson Bay	5	2	2240	52.1340	128.3780
22	2010	8	12	Thompson Bay	5	3	2305	52.1480	128.3980
23	2010	8	12	Thompson Bay	5	5	2330	52.1587	128.3902
24	2010	8	12	Thompson Bay	5	4	0005	52.1590	128.3540
25	2010	8	13	East Higgins Pass	8	1	2210	52.4020	128.5580
26	2010	8	13	East Higgins Pass	8	2	2250	52.4360	128.5950
27	2010	8	13	East Higgins Pass	8	3	2325	52.4710	128.6380
28	2010	8	13	East Higgins Pass	8	5	2355	52.4917	128.6615
29	2010	8	13	East Higgins Pass	8	4	0025	52.4920	128.6930
30	2010	8	14	Kitasu Bay	7	1	2205	52.5500	128.8000
31	2010	8	14	Kitasu Bay	7	2	2230	52.5450	128.7710
32	2010	8	14	Kitasu Bay	7	5	2300	52.5551	128.7515
33	2010	8	14	Kitasu Bay	7	3	2325	52.5410	128.7420
34	2010	8	14	Kitasu Bay	7	4	2350	52.5250	128.7510

Table 1 continued...

Set	Year	Month	Set Day	Set Location Name	Set Code	Station	Set Start Time	DD Lat (N)	DD Long (W)
35	2010	8	15	Meyers Pass	6	4	2205	52.6549	128.5758
36	2010	8	15	Meyers Passage	6	3	2225	52.6645	128.5621
37	2010	8	15	Meyers Passage	6	1	2245	52.6730	128.5720
38	2010	8	15	Meyers Passage	6	2	2305	52.6840	128.5770
39	2010	8	15	Meyers Passage	6	5	2335	52.6725	128.5994
40	2010	8	16	Powell Anchorage	9	3	2205	52.3207	128.3780
41	2010	8	16	Powell Anchorage	9	4	2235	52.3255	128.3442
42	2010	8	16	Powell Anchorage	9	5	2300	52.3117	128.3587
43	2010	8	16	Powell Anchorage	9	1	2325	52.2910	128.3760
44	2010	8	16	Powell Anchorage	9	2	2350	52.2840	128.3550
45	2010	8	17	Spiller Channel	10	3	2205	52.2770	128.2350
46	2010	8	17	Spiller Channel	10	4	2230	52.2900	128.2590
47	2010	8	17	Spiller Channel	10	2	2255	52.2680	128.2710
48	2010	8	17	Spiller Channel	10	1	2325	52.2500	128.2740
49	2010	8	17	Spiller Channel	10	5	0000	52.2632	128.3357
50	2010	8	18	Hunter Channel	11	2	2205	52.0570	128.1410
51	2010	8	18	Hunter Channel	11	5	2225	52.0660	128.1594
52	2010	8	18	Hunter Channel	11	4	2250	52.0780	128.1530
53	2010	8	18	Hunter Channel	11	3	2310	52.0730	128.1350
54	2010	8	18	Hunter Channel	11	1	2335	52.0570	128.1150
55	2010	8	19	Fish Egg Inlet	1	1	2150	51.6210	127.7450
56	2010	8	19	Fish Egg Inlet	1	2	2220	51.6040	127.7730
57	2010	8	19	Fish Egg Inlet	1	5	2250	51.6320	127.7770
58	2010	8	19	Fish Egg Inlet	1	3	2325	51.6170	127.8320
59	2010	8	19	Fish Egg Inlet	1	4	2355	51.6470	127.8280
60	2010	8	20	Rivers Inlet	14	3	2150	51.5922	127.5678
61	2010	8	20	Rivers Inlet	14	5	2220	51.5652	127.5892
62	2010	8	20	Rivers Inlet	14	4	2240	51.5724	127.5752
63	2010	8	20	Rivers Inlet	14	2	2310	51.5795	127.5490
64	2010	8	20	Rivers Inlet	14	1	2335	51.5570	127.5555

Table 2. Summary of the number and weight by species, transect, and station from the 2010 Central Coast juvenile herring survey.

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
1	2	4	Kwakshua Channel	**Pacifc herring age-0+**	1	0.01
				Pacifc herring age-1+	7	0.22
				Pacific sand lance	2	trace
				Juvenile walleye pollock	1	0.01
2	2	3	Kwakshua Channel	**Pacifc herring age-0+**	100	0.37
				Pacifc herring age-1+	3	0.10
				Pacifc herring age-2+	1	0.04
				Pacific sand lance	2	trace
				Juvenile rockfish	1	trace
				Capelin	1	trace
				Juvenile walleye pollock	1	0.01
3	2	2	Kwakshua Channel	**Pacifc herring age-0+**	17	0.07
				Pacifc herring age-1+	29	0.69
				Pacifc herring age-2+	2	0.11
				Pacific sand lance	37	0.06
				Pacific sandfish	3	0.04
				Sculpin	3	0.05
				Pink salmon	1	2.00
				Capelin	11	0.02
4	2	1	Kwakshua Channel	**Pacifc herring age-0+**	64	0.21
				Pacifc herring age-1+	3	0.09
				Pacific sand lance	6	0.01
				Juvenile rockfish	1	trace
5	2	5	Kwakshua Channel	**Pacifc herring age-0+**	30852	94.07
6	13	1	Dean Channel	**Pacifc herring age-0+**	33	0.17
				Pacifc herring age-1+	1	0.02
				Three-spine stickleback	9	0.03
				Coho salmon	2	0.03
				Chinook salmon	1	0.04

* Weights ≤ 9g referred to as trace

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
7	13	2	Dean Channel	**Pacifc herring age-0+**	136	0.73
				Pacifc herring age-1+	196	4.56
				Three-spine stickleback	42	0.13
				Northern anchovy	4	0.08
				Chum salmon	4	0.10
				Juvenile rockfish	2	trace
8	13	3	Dean Channel	**Pacifc herring age-0+**	8568	46.65
				Pacifc herring age-1+	105	2.76
				Pacifc herring age-2+	21	1.15
9	13	4	Dean Channel	**Pacifc herring age-0+**	1752	9.02
				Pacifc herring age-1+	162	4.32
				Capelin	120	0.09
				Three-spine stickleback	42	0.14
10	13	5	Dean Channel	**Pacifc herring age-0+**	109	0.48
				Pacifc herring age-1+	75	1.65
				Three-spine stickleback	8	0.03
				Coho salmon	3	0.07
				Chum salmon	1	0.02
11	12	4	Burke Channel	***NO CATCH***		
12	12	6	Burke Channel	**Pacifc herring age-1+**	1	0.02
				Coho salmon	1	0.03
				Three-spine stickleback	1	trace
13	12	2	Burke Channel	***NO CATCH***		
14	12	5	Burke Channel	**Pacifc herring age-0+**	17	0.12
				Pacifc herring age-1+	26	0.69
				Capelin	2	trace
				Spiny dogfish	2	
				Pacific sand lance	1	trace

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
15	4	3	Kildidt Sound	**Pacifc herring age-0+**	1074	3.45
				Pacifc herring age-1+	600	13.34
				Pacifc herring age-2+	12	0.51
				Capelin	6	trace
				Coho salmon	6	1.07
16	4	4	Kildidt Sound	**Pacifc herring age-0+**	16172	58.51
17	4	1	Kildidt Sound	**Pacifc herring age-0+**	1203	3.55
				Pacifc herring age-1+	117	2.04
				Pacific sardine	9	1.91
				Three-spine stickleback	9	0.01
				Poacher	6	0.01
				Juvenile walleye pollock	6	0.02
18	4	5	Kildidt Sound	**Pacifc herring age-0+**	38199	109.60
19	4	2	Kildidt Sound	**Pacifc herring age-0+**	96	0.12
				Pacifc herring age-1+	1	0.01
				Capelin	23	0.01
				Juvenile rockfish	17	0.03
				Shiner perch	6	0.04
				Three-spine stickleback	4	trace
				Sculpin	1	trace
20	5	1	Thompson Bay	**Pacifc herring age-0+**	1	0.01
21	5	2	Thompson Bay	Spiny dogfish	1	0.50
22	5	3	Thompson Bay	**Pacifc herring age-0+**	14	0.02
				Juvenile walleye pollock	21	0.09
				Capelin	3	trace
				Juvenile rockfish	3	0.01
				Shiner perch	1	trace
23	5	5	Thompson Bay	**Pacifc herring age-0+**	1611	3.95

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
24	5	4	Thompson Bay	**Pacifc herring age-0+**	228	0.43
				Juvenile rockfish	21	0.04
				Juvenile walleye pollock	3	trace
				Shiner perch	3	0.02
				Three-spine stickleback	2	trace
				Flatfish	1	0.70
				Pacific sand lance	1	trace
25	8	1	East Higgins Pass	**Pacifc herring age-1+**	64	1.50
26	8	2	East Higgins Pass	***NO CATCH***		
27	8	3	East Higgins Pass	**Pacifc herring age-0+**	18	0.03
				Pacifc herring age-1+	4	0.06
				Juvenile rockfish	3	0.01
				Three-spine stickleback	1	trace
28	8	5	East Higgins Pass	Capelin	6	0.03
				Pacifc herring age-0+	1116	1.64
				Pacifc herring age-1+	57	0.98
				Pacifc herring age-2+	3	0.11
				Juvenile walleye pollock	324	1.23
				Juvenile rockfish	3	0.01
				Three-spine stickleback	3	trace
29	8	4	East Higgins Pass	**Pacifc herring age-0+**	38	0.08
				Pacifc herring age-1+	1	0.02
				Juvenile walleye pollock	21	0.03
				Juvenile rockfish	5	0.01
				Capelin	1	trace
				Octopus	1	trace
				Three-spine stickleback	1	trace
30	7	1	Kitasu Bay	**Pacifc herring age-0+**	2354	3.24
				Pacifc herring age-1+	11	0.17
31	7	2	Kitasu Bay	**Pacifc herring age-0+**	12710	46.73

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
32	7	5	Kitasu Bay	**Pacifc herring age-0+**	539	1.20
				Juvenile walleye pollock	7	0.01
33	7	3	Kitasu Bay	**Pacifc herring age-0+**	1848	3.13
				Pacifc herring age-1+	28	0.52
				Capelin	56	0.01
				Chum salmon	8	0.30
				Flatfish	4	trace
34	7	4	Kitasu Bay	**Pacifc herring age-0+**	1797	3.72
				Pacifc herring age-1+	3	0.12
35	6	4	Meyers Pass	**Pacifc herring age-0+**	291	0.42
				Pacifc herring age-1+	3	0.04
				Capelin	7	trace
				Juvenile walleye pollock	6	0.02
				Juvenile rockfish	1	trace
				Pacific sand lance	1	trace
36	6	3	Meyers Passage	**Pacifc herring age-0+**	5130	7.13
				Juvenile rockfish	6	0.01
37	6	1	Meyers Passage	**Pacifc herring age-0+**	1458	2.08
				Juvenile walleye pollock	3	1.20
38	6	2	Meyers Passage	**Pacifc herring age-0+**	810	1.30
				Capelin	12	0.01
				Three-spine stickleback	2	trace
39	6	5	Meyers Passage	**Pacifc herring age-0+**	576	0.81
				Capelin	36	0.04
				Three-spine stickleback	12	0.01
				Juvenile walleye pollock	8	0.01
				Pacific sardine	4	0.77

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
40	9	3	Powell Anchorage	**Pacifc herring age-0+**	666	3.35
				Pacifc herring age-1+	1287	31.04
				Pacifc herring age-2+	9	0.42
41	9	4	Powell Anchorage	**Pacifc herring age-0+**	9251	18.89
				Capelin	1045	1.13
				Juvenile walleye pollock	22	0.21
				Pacific sardine	11	2.25
42	9	5	Powell Anchorage	**Pacifc herring age-0+**	5445	16.60
				Capelin	132	0.13
43	9	1	Powell Anchorage	**Pacifc herring age-0+**	1422	3.44
44	9	2	Powell Anchorage	**Pacifc herring age-0+**	1584	3.92
				Pacifc herring age-1+	16	0.25
				Juvenile walleye pollock	16	1.35
				Three-spine stickleback	12	0.03
				Juvenile rockfish	4	0.01
45	10	3	Spiller Channel	**Pacifc herring age-0+**	3456	16.20
				Pacifc herring age-1+	162	4.36
				Coho salmon	9	1.45
46	10	4	Spiller Channel	**Pacifc herring age-0+**	8401	36.75
47	10	2	Spiller Channel	**Pacifc herring age-0+**	22082	86.57
				Pacifc herring age-1+	6588	150.89
				Juvenile walleye pollock	244	2.45
				Pacific sand lance	61	0.11
48	10	1	Spiller Channel	**Pacifc herring age-0+**	54	0.23
				Pacifc herring age-1+	190	5.48
				Pacifc herring age-2+	15	0.80
				Coho salmon	2	0.26
				Capelin	1	trace
				Squid	1	0.43

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
49	10	5	Spiller Channel	**Pacifc herring age-0+**	346	1.52
50	11	2	Hunter Channel	**Pacifc herring age-0+**	6556	20.31
				Pacifc herring age-1+	99	2.52
				Capelin	583	0.57
51	11	5	Hunter Channel	**Pacifc herring age-0+**	5478	20.06
				Pacifc herring age-1+	33	0.66
52	11	4	Hunter Channel	**Pacifc herring age-0+**	6112	22.76
				Pacifc herring age-1+	80	1.99
				Capelin	160	0.17
53	11	3	Hunter Channel	**Pacifc herring age-0+**	2082	8.80
				Pacifc herring age-1+	96	2.47
				Capelin	6	trace
				Coho salmon	6	0.86
54	11	1	Hunter Channel	**Pacifc herring age-0+**	1260	3.36
				Pacifc herring age-1+	21	0.29
				Capelin	24	0.02
55	1	1	Fish Egg Inlet	**Pacifc herring age-0+**	1604	3.59
				Pacifc herring age-1+	120	2.94
				Capelin	480	0.31
				Three-spine stickleback	368	0.42
56	1	2	Fish Egg Inlet	**Pacifc herring age-0+**	1862	3.95
				Juvenile walleye pollock	14	0.05
57	1	5	Fish Egg Inlet	Pacific sardine	3868	751.94
58	1	3	Fish Egg Inlet	**Pacifc herring age-0+**	5490	15.76
				Pacifc herring age-1+	16	0.53
				Pacifc herring age-2+	11	0.55
				Pacific sardine	414	88.27

Table 2 continued...

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
59	1	4	Fish Egg Inlet	**Pacifc herring age-0+**	14066	32.53
				Capelin	156	0.18
60	14	3	Rivers Inlet	**Pacifc herring age-0+**	3597	12.25
				Pacifc herring age-1+	803	21.24
				Coho salmon	11	0.14
61	14	5	Rivers Inlet	Capelin	2192	1.62
				Pacifc herring age-0+	12352	24.28
				Pacifc herring age-1+	560	14.17
62	14	4	Rivers Inlet	**Pacifc herring age-0+**	1212	3.66
				Pacifc herring age-1+	24	0.57
				Capelin	12	0.01
				Coho salmon	12	0.20
				Shiner perch	3	0.01
63	14	2	Rivers Inlet	**Pacifc herring age-0+**	44	0.20
				Pacifc herring age-1+	9	0.27
				Capelin	589	0.33
				Chum salmon	19	0.49
				Coho salmon	5	0.39
				Juvenile hake	1	trace
64	14	1	Rivers Inlet	**Pacifc herring age-1+**	3	0.09
				Capelin	258	0.16
				Chum salmon	5	0.16
				Coho salmon	5	0.66
				Northern anchovy	1	0.01

Table 3. Percent occurrence by species in purse seine sets from the 2009 Central Coast juvenile herring survey.

Species Caught		
Common Name	**Scientific Name**	**% Occurrence**
Pacific herring age-0+	*Clupea pallasi* in year of birth	87.50
Pacific herring age-1+	*Clupea pallasi* in first year	60.94
Pacific herring age-2+	*Clupea pallasi* in second or more years	12.50
Capelin	*Mallotus villosus*	40.63
Chinook salmon	*Oncorhynchus tshawytscha*	1.56
Chum salmon	*Oncorhynchus keta*	7.81
Coho salmon	*Oncorhynchus kisutch*	17.19
Flatfish	*Parophyrus vetulus, Lepidopsetta bilineata, Platichthys stellatus,* or *Citharichthys stigmaens*	3.13
Juvenile hake	*Merluccius productus*	1.56
Juvenile pollock	*Theragra chalcogramma*	23.44
Juvenile rockfish	*Sebastes sp.*	18.75
Northern anchovy	*Engraulis mordax mordax*	3.13
Octopus	*Enteroctopus dofleini*	1.56
Pacific sardine	*Sardinops sagax*	7.81
Pink salmon	*Oncorhynchus gorbuscha*	1.56
Poacher	*Agonus acipenserinus*	1.56
Sandfish	*Trichodon trichodon*	1.56
Sand lance	*Ammodytes hexapterus*	12.50
Sculpin	*Leptocottus armatus*	3.13
Shiner perch	*Cymatogaster aggregata*	6.25
Spiny dogfish	*Squalus acanthias*	3.13
Squid	*Loligo opalescens* or *Gonatus fabricii*	1.56
Three-spine stickleback	*Gasterosteus aculeatus*	23.44

Table 4. Summary of the number of herring sampled including length and weight (range, mean, and standard deviations) for each of the three herring age classes encountered. Total catch in numbers (N) and weight (Wt) of all herring by transect for the 2010 Central Coast juvenile herring survey.

Age-0+			Length (mm)			Weight (g)				
Location Name	Set Code	Number Sampled	Range	Mean	SD	Range	Mean	SD	N	Wt (Kg)
Fish Egg Inlet	1	400	44-82	57	5.17	1.30-6.53	2.39	0.62	23022	55.82
Kwakshua	2	282	36-88	65	6.69	0.54-8.28	3.42	1.24	31034	94.73
Kildidt Sound	4	501	30-92	60	9.39	0.18-12.76	2.78	1.29	56744	175.25
Thompson Bay	5	215	28-81	53	8.40	0.15-6.64	2.12	0.96	1854	4.40
Meyers Passage	6	501	37-91	50	4.87	0.44-9.18	1.45	0.56	8265	11.74
Kitasu Bay	7	477	40-78	56	8.68	0.76-5.60	2.21	1.12	19248	58.01
East Higgins Pass	8	156	38-87	51	8.52	0.59-7.92	1.66	1.12	56	0.11
Powell Anchorage	9	474	41-92	60	8.89	0.96-10.06	2.89	1.31	18368	46.20
Spiller Channel	10	454	57-88	70	5.36	2.23-7.98	4.33	0.95	34339	141.27
Hunter Channel	11	500	50-84	65	5.75	1.73-7.48	3.48	0.92	21488	75.29
Burke Channel	12	17	73-86	81	3.57	4.71-8.77	7.34	0.96	17	0.12
Dean Channel	13	410	60-88	72	4.70	3.10-8.83	5.04	0.95	10598	57.04
Rivers Inlet	14	344	41-84	62	9.10	0.79-7.05	3.04	1.33	4853	16.12
TOTALS		4731	28-92	61	9.90	0.15-12.76	2.99	1.48	229886	736.11

Table 4 continued…

Age-1+			Length (mm)			Weight (g)				
Location Name	Set Code	Number Sampled	Range	Mean	SD	Range	Mean	SD	N	Wt (Kg)
Fish Egg Inlet	1	31	100-140	120	10.18	14.05-38.25	24.79	6.70	136	3.48
Kwakshua Channel	2	42	101-142	125	8.94	14.93-42.28	26.16	5.73	42	1.10
Kildidt Sound	4	140	94-138	114	10.63	11.67-36.29	20.86	6.12	718	15.40
Thompson Bay	5	-	-	-	-	-	-	-	-	-
Meyers Passage	6	3	96-103	100	3.79	13.32-13.80	13.52	0.25	3	0.04
Kitasu Bay	7	9	103-139	112	11.41	14.25-40.48	20.63	8.01	42	0.81
East Higgins Pass	8	88	93-130	114	8.11	10.08-30.20	21.57	4.93	126	2.55
Powell Anchorage	9	129	95-138	119	7.43	11.46-36.71	23.89	4.64	1303	31.29
Spiller Channel	10	212	103-142	122	8.73	13.74-45.24	25.76	6.55	6940	160.73
Hunter Channel	11	40	95-136	116	9.85	10.96-41.24	23.06	6.52	329	7.94
Burke Channel	12	27	111-133	122	5.99	18.06-34.73	26.40	4.60	27	0.71
Dean Channel	13	206	99-141	117	7.35	12.99-44.03	23.31	5.01	539	13.31
Rivers Inlet	14	128	101-138	122	7.53	12.11-40.00	26.24	5.21	1399	36.34
TOTALS		1055	93-142	119	9.10	10.08-45.24	23.93	5.95	11604	273.69

Table 4 continued…

Age-2+			Length (mm)			Weight (g)				
Location Name	Set Code	Number Sampled	Range	Mean	SD	Range	Mean	SD	N	Wt (Kg)
Fish Egg Inlet	1	1	156	156	-	50.82	50.82	-	11	0.55
Kwakshua Channel	2	3	147-168	157	10.54	38.35-67.34	50.05	15.28	3	0.15
Kildidt Sound	4	2	143-145	144	1.41	36.81-47.74	42.28	7.73	12	0.51
Thompson Bay	5	-	-	-	-	-	-	-	-	-
Meyers Passage	6	-	-	-	-	-	-	-	-	-
Kitasu Bay	7	-	-	-	-	-	-	-	-	-
East Higgins Pass	8	1	143	143	-	37.58	37.58	-	3	0.11
Powell Anchorage	9	1	149	149	-	46.73	46.73	-	9	0.42
Spiller Channel	10	15	144-170	153	7.15	44.21-78.17	53.63	8.48	15	0.80
Hunter Channel	11	-	-	-	-	-	-	-	-	-
Burke Channel	12	-	-	-	-	-	-	-	-	-
Dean Channel	13	1	152	152	-	54.86	54.86	-	21	1.15
Rivers Inlet	14	-	-	-	-	-	-	-	-	-
TOTALS		24	143-170	152	7.40	36.81-78.17	51.21	9.33	74	3.70

Table 5. Grouping of organisms, by phylum with abbreviations from plankton tows from the 2010 Central Coast juvenile herring survey.

Coelenterata	
COEL	Medusae - *Aequorea victoria*
SIPH	Siphonophores
Ctenophora	
CTEN	Ctenophores
Annelida	
POLY	Polychaetes
Mollusca	
GAST	Prosobranch gastropods
PELE	Pelecypods
Arthropoda	
AMPH	Amphipods
BARN	Barnacle; unknown stage
CLAD	Cladocerans; Podon sp. and Evadne sp.
COPE	Copepods (Table 6 for complete species list)
CRAM	Crab megalopea
CRAZ	Crab zoea
EUPA	Adult euphausiids; mainly *Euphausia pacifica*
EUPL	Larval euphausiids; mainly *Euphausia pacifica*
MYSI	Mysids
SEAL	Sea lice - *Caligus elongatus*
SHRI	Shrimp zoea
Ectoprocta	
ECTO	Ectoprocts; mostly *Membranipora sp.* larvae (cyphonautes)
Echinodermata	
ECHI	Echinoderm larvae
Chaetognatha	
CHAE	Chaetognaths; mostly *Sagitta sp.*
Chordata	
LARV	Larvaceans; mostly *Oikopluera sp.* and *Fritillaria sp.*
FISHL	Larval fish; unknown species
Miscellaneous	
EGGS	Mainly euphausiid eggs, with some teleost eggs

Table 6. Abbreviations for calanoid and cyclopoid copepods identified in plankton samples from the 2010 Central Coast juvenile herring survey.

Calanoid copepods	
ALON	*Acartia longimeres*
CABD	*Centropages abdominalis*
CALA	*Calanus sp.*
CCRI	*Calanus cristatus*
CMAR	*Calanus marshallae*
CPAC	*Calanus pacificus*
EBUN	*Eucalanus bungii*
ELON	*Epilabidocera longipedata*
JCAL	Juvenile calanoid
METR	*Metridia sp.*
MPAC	*Metridia pacifica*
NPLU	*Neocalanus plumchrus*
OBOR	*Oncaea borealis*
PPAR	*Paracalanus parvus*
PSEU	*Pseudocalanus sp.*
TDIS	*Tortanus discaudatus*
Cyclopoid copepods	
CANG	*Corycaeus anglicus*
OATL	*Oithona atlantica*
OITH	*Oithona sp.*
OSIM	*Oithona similis*
Harpacticoid copepods	
UHAR	Unidentified harpacticoids

Table 7. Number of zooplankton per set per volume (m^3) of water observed in samples from the 2010 Central Coast juvenile herring survey.

Location	Set Code	Station	Volume	ALON	AMPH	BARN	CABD	CALA	CANG	CCRI	CHAE	CLAD
Fish Egg Inlet	1	1	17.8509	20.6	1.0	-	2.7	-	-	-	1.3	66.3
		2	17.5256	32.8	0.6	55.2	5.6	1.1	-	-	-	19.6
Kwakshua Channel	2	3	7.3983	509.0	4.5	138.7	17.3	-	-	-	-	-
		4	11.2243	262.3	17.2	74.2	5.7	56.0	-	-	0.2	5.7
Kildidt Sound	4	3	16.7043	72.8	0.5	53.6	72.8	36.6	-	-	1.0	7.7
		4	17.2612	207.6	0.2	133.7	194.7	0.1	-	-	0.1	40.8
Thompson Bay	5	1	17.6521	223.7	11.8	-	89.6	7.6	-	-	1.7	-
		3	17.6795	68.8	0.7	5.7	91.4	1.8	-	-	-	-
Meyers Pass	6	1	12.3747	38.8	4.0	41.8	20.0	-	-	-	-	16.8
		4	11.1428	40.4	-	54.0	29.0	-	1.4	-	-	1.4
Kitasu Bay	7	1	15.6050	146.2	1.5	-	21.5	-	-	-	-	1.0
		2	18.1275	1038.0	0.1	0.1	89.0	-	-	-	0.1	-
East Higgins Pass	8	1	16.5070	200.8	0.4	7.8	11.6	4.2	-	0.1	1.0	-
		4	16.0644	161.5	1.4	93.1	255.2	-	-	-	0.1	187.2
Powell Anchorage	9	3	16.9192	80.4	-	18.4	13.2	-	-	-	0.1	26.5
		4	18.1092	157.3	0.1	30.8	14.1	-	-	-	1.8	45.9
Spiller Channel	10	3	13.0132	61.5	78.7	110.7	24.6	32.6	2.5	-	-	-
		4	17.1790	39.1	1.9	58.0	1.9	0.2	-	-	-	22.4
Hunter Channel	11	2	10.1631	541.6	503.9	289.7	25.2	-	-	-	-	25.2
		3	12.0593	254.7	0.1	101.5	34.5	-	-	-	0.1	2.7
Burke Channel	12	3	12.6947	22.6	0.6	10.1	-	-	-	-	-	10.1
		4	11.3592	22.5	1.4	16.9	-	14.6	-	-	-	-
Dean Channel	13	1	14.0379	104.9	7.0	0.1	-	4.6	-	-	-	9.1
		2	11.4628	271.7	5.8	5.7	-	-	-	-	-	27.9
Rivers Inlet	14	2	11.6403	100.1	0.2	27.5	-	3.6	1.4	-	1.1	53.6
		3	7.8547	154.6	0.1	69.6	-	0.4	-	-	-	59.1

Table 7 continued…

Set Code	Station	CMAR	COEL	CPAC	CRAM	CRAZ	CTEN	EBUN	ECHI	ECTO	EGGS	ELON	EUPA
1	1	-	1.1	-	0.1	1.5	0.1	-	-	2.7	173.0	0.1	1.6
	2	-	3.2	-	0.3	2.9	0.5	-	-	2.7	8.7	-	-
2	3	-	0.1	-	0.3	7.0	0.7	0.7	186.0	164.4	86.5	-	-
	4	1.6	5.9	-	-	0.9	0.1	2.5	39.9	68.4	199.6	-	0.1
4	3	2.9	-	1.2	1.9	39.5	-	-	-	3.8	306.5	7.9	-
	4	-	18.8	-	0.3	42.3	0.2	0.1	-	11.1	11.1	-	-
5	1	3.2	0.3	0.1	0.3	5.4	-	-	-	3.6	-	-	-
	3	-	1.8	-	7.2	44.1	-	-	-	-	-	-	-
6	1	-	13.5	-	1.1	0.6	18.8	-	1.3	20.7	53.0	-	-
	4	-	7.5	-	1.1	4.3	27.5	-	2.9	30.2	4.3	-	-
7	1	-	2.2	-	0.3	2.3	4.5	-	-	3.1	60.5	-	-
	2	-	0.9	-	0.8	4.5	2.8	-	-	3.5	-	-	-
8	1	2.4	-	0.4	0.1	0.6	-	-	-	27.1	23.3	-	1.5
	4	0.4	11.5	-	4.2	9.2	-	-	-	43.8	-	-	-
9	3	0.1	0.6	0.2	0.1	3.5	1.9	-	-	10.4	9.5	-	-
	4	-	0.3	-	1.7	22.6	1.5	-	-	24.7	30.0	-	-
10	3	0.6	2.5	21.2	-	2.8	0.3	-	-	36.9	98.4	-	1.2
	4	-	7.1	0.1	0.1	2.7	5.5	-	-	111.8	141.6	-	-
11	2	-	-	-	-	-	-	-	-	-	245.6	-	-
	3	-	0.4	-	0.2	11.1	4.4	-	2.7	15.9	61.1	-	-
12	3	-	37.2	-	-	6.3	42.9	76.4	302.5	10.1	5.0	-	-
	4	-	9.9	-	0.7	8.5	105.6	116.9	636.7	-	16.9	-	-
13	1	0.1	2.1	-	-	2.4	9.3	5.7	-	4.6	-	-	-
	2	-	2.1	-	-	-	5.2	6.0	-	11.2	16.7	-	-
14	2	-	-	0.1	-	-	-	0.3	-	4.1	55.0	-	0.2
	3	0.1	0.4	-	-	0.1	-	0.9	-	6.1	24.4	-	0.1

Table 7 continued…

Set Code	Station	EUPL	FISHL	GAST	JCAL	LARV	METR	MPAC	MYSI	NPLU	OATL	OBOR	OITH
1	1	-	-	0.9	-	17.9	-	-	-	-	-	-	-
	2	-	-	-	-	25.1	-	1.3	-	-	-	-	-
2	3	61.5	4.3	26.0	-	575.8	-	-	-	-	-	-	-
	4	27.2	0.1	74.1	-	148.2	-	-	-	-	-	5.7	-
4	3	90.0	-	19.2	-	3.8	-	-	-	-	-	-	-
	4	97.0	0.1	29.7	-	22.2	-	0.1	-	-	-	-	-
5	1	11.7	-	3.6	-	-	-	-	-	-	-	-	-
	3	-	-	1.8	-	27.4	-	-	-	-	-	-	-
6	1	22.9	0.1	-	-	58.2	-	-	-	-	1.3	-	-
	4	24.6	0.4	2.9	-	71.8	-	-	2.5	-	-	-	1.4
7	1	19.5	-	-	-	2.1	-	-	-	-	-	-	-
	2	28.6	-	-	-	3.5	-	0.1	-	-	-	-	-
8	1	3.3	0.1	-	-	-	-	6.8	-	0.1	-	-	-
	4	-	0.1	8.0	-	12.0	-	0.6	-	-	-	4.0	-
9	3	6.9	0.1	2.8	-	7.6	-	0.4	-	-	-	-	-
	4	0.1	-	-	-	23.0	-	0.1	0.1	-	-	-	-
10	3	44.6	-	14.8	-	66.4	-	-	0.3	-	-	-	-
	4	38.2	0.1	7.5	-	24.2	-	-	-	-	-	-	-
11	2	34.6	-	12.6	-	63.0	-	333.8	-	-	-	-	-
	3	15.0	-	29.2	0.1	145.9	-	-	0.2	-	-	-	-
12	3	117.2	-	15.1	-	116.0	-	-	-	-	-	-	-
	4	139.4	-	16.9	-	39.4	-	-	-	-	-	-	-
13	1	22.8	-	13.7	-	376.7	-	-	-	-	-	2.3	-
	2	22.3	-	27.9	-	893.4	-	-	-	-	5.6	16.7	72.6
14	2	24.5	-	11.0	-	72.9	-	-	-	-	-	-	-
	3	19.6	-	30.6	-	50.0	2.9	2.9	0.1	-	-	-	6.1

Table 7 continued…

Set Code	Station	OSIM	PELE	POLY	PPAR	PSEU	SEAL	SHRI	SIPH	TDIS	UHAR
1	1	0.9	-	-	-	10.8	-	1.5	-	2.7	-
	2	-	-	-	2.7	-	-	0.7	-	1.1	-
2	3	21.6	-	21.6	22.2	18.1	-	2.2	-	-	4.3
	4	-	-	-	17.1	390.0	0.1	0.7	-	-	-
4	3	-	-	3.8	7.7	172.4	-	1.2	-	-	-
	4	-	-	7.5	11.1	69.5	-	0.8	0.5	6.5	-
5	1	-	-	-	21.8	440.9	-	4.1	-	0.1	-
	3	9.1	-	-	9.1	107.7	0.2	27.2	0.2	-	-
6	1	-	-	1.3	1.3	22.6	0.1	0.1	1.3	-	-
	4	-	-	3.2	2.9	3.9	-	2.9	4.1	-	-
7	1	2.1	-	-	3.3	2.2	-	0.1	-	0.1	-
	2	3.5	-	-	9.9	-	-	0.1	-	-	-
8	1	3.9	-	0.1	28.7	238.1	-	0.6	-	-	-
	4	31.9	-	8.0	34.1	64.6	-	4.9	-	32.2	-
9	3	-	-	0.9	22.2	28.8	-	0.6	0.1	-	-
	4	-	-	0.1	10.6	1.8	-	4.5	0.2	-	-
10	3	-	2.5	1.8	30.3	113.6	-	2.5	1.2	-	-
	4	-	1.9	5.6	29.0	8.2	-	0.3	8.2	-	-
11	2	-	12.6	-	114.6	414.3	-	-	-	-	-
	3	-	5.3	-	78.5	287.7	-	0.7	-	-	-
12	3	-	-	62.4	96.4	100.8	-	0.6	5.0	-	-
	4	-	45.1	47.9	58.0	93.0	-	4.9	-	-	-
13	1	38.8	-	-	9.1	63.8	-	2.7	-	-	-
	2	50.2	-	-	28.8	73.7	-	0.3	-	-	-
14	2	8.2	-	0.3	-	83.0	-	0.2	1.4	-	-
	3	2.0	-	2.0	-	78.7	-	1.0	1.3	-	-